CIBM Center for Biomedical Imaging

CIBM Research Seminar Announcement

Measuring metabolite diffusion with diffusion-weighted MR spectroscopy

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Friday December 13th, 13h15

CIBM Seminar Room, EPFL campus, Station 6 CH F1 614 Lausanne

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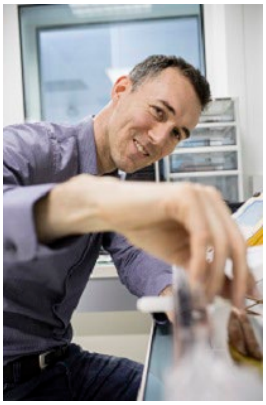
Abstract: Diffusion-weighted NMR spectroscopy (DW-MRS) offers the unique ability to non-invasively quantify the diffusion of endogenous metabolites in vivo. In contrast to water, which is ubiquitous in biological tissues, most metabolites are confined within cells. Their diffusion properties are thus expected to mostly depend on intracellular parameters such as cytosol viscosity, molecular crowding, size and shape of the cell... Furthermore, in the brain, some metabolites are thought to exhibit preferential compartmentation, with N-acetyl-aspartate (NAA) and glutamate (Glu) being mostly in neurons, while myo-inositol (mIns) and choline compounds (tCho) are thought to be preferentially compartmentalized in glial cells. Cellular specificity has been the main motivation driving methodological research and applications of DW-MRS in vivo over the last 25 years.

We will first evoke some general difficulties and advantages of metabolite diffusion as compared to water diffusion. Then, we will browse the main applications of DW-MRS to date, including the determination of lipid droplets diameter, the measurement of alterations of metabolite apparent diffusion coefficient (ADC) in brain diseases, and more recently the modeling of DW-MRS data to gain some quantitative information about brain cell microstructure. Finally, in a more technically-oriented section, we will examine how to implement DW-MRS



Biography: Dr. Julien Valette worked as a scientific project leader at NeuroSpin (CEA), where he developed a new approach for high-sensitivity MRI of 19F, allowing the detection of targeted contrast agents in a mouse model of glioblastoma. Since 2009, he is the manager of the NMR platform and the leader of the NMR team in MIRCen, a preclinical facility of CEA aiming at developing new animal models, therapeutic strategies and imaging tools for neurodegenerative diseases. The main focus of his current research is the development and application of diffusion-weighted NMR spectroscopy methods in vivo to quantify brain cells structure and metabolic compartmentation, for which he got a Starting Grant from the European Research Council in 2013 and a Consolidator Grant in 2018.